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Prolonged Exposure Therapy Following Awareness Under Anesthesia: A Case Study

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Awareness during surgery is estimated to effect between 40,000 to 140,000 patients per year in the United States, and there is a growing literature suggesting that this event can lead to the development of posttraumatic stress disorder (PTSD). The current article describes treatment implemented from a manualized protocol of a woman diagnosed with PTSD following awareness during a routine surgery. Prolonged exposure therapy was delivered to the client over 12 sessions. Treatment consisted of psychoeducation, imaginal exposure, in-vivo exposure, breathing retraining, progressive muscle relaxation, and homework assignments. At treatment completion and at follow-up 10 weeks after completion of therapy, the client no longer met criteria for PTSD. Prolonged exposure therapy for PTSD is an effective treatment that alleviates symptoms of PTSD from awareness during surgery.

Failure of general anesthesia to render a patient insensate (i.e., awareness) is estimated to affect between 40,000 to 140,000 patients in the United States yearly (Osterman, Hopper, Heran, Keane, & van der Kolk, 2001). Individuals who awake during surgery report a variety of experiences, including hearing sounds and voices, feeling touch, pain, paralysis, helplessness, anxiety, fear, and severe panic (Schwender et al., 1998). Many people who experience awareness during surgery report continued distress years after surgery (Lenmarken, Bildfors, Enlund, Samuelsson, & Sandin, 2002), including the re-occurrence of pain symptoms associated with the surgery (Salomons, Osterman, Gagliese, & Katz, 2004). However, only a small number of studies have assessed symptoms of posttraumatic stress disorder (PTSD) after awareness. The studies that have assessed such symptoms report that a significant portion of individuals experience symptoms of PTSD: Osterman et al. (2001) reported that 9 out of 16 individuals (56.3%) who were aware during surgery (conducted on average 18 years prior to the assessment; range 1–38 years) met criteria for PTSD. In comparison, zero controls met criteria for PTSD. Leslie, Chan, Myles, Forbes, and McCulloch (2010) found that 7 out of 13 individuals (71%) met criteria for PTSD after awareness, whereas 3 out of 25 (12%) matched controls (who had surgery but not awareness) fulfilled criteria for PTSD. In these individuals, the median onset of symptoms was 14 days after surgery, and the median duration of symptoms was 4.7 years.

Given that awareness during surgery can lead to significant mental distress, it is necessary to explore treatments that may alleviate such suffering. The most strongly supported treatments for PTSD are cognitive behavioral therapies (CBT) such as cognitive processing therapy (CPT; Resick & Schnicke, 1992) and prolonged exposure therapy (PET; e.g., Foa et al., 2005). However, some researchers have specifically recommended the use of eye-movement desensitization reprocessing (EMDR) or hypnosis for PTSD resulting from awareness during surgery (Bruchas, Kent, Wilson, & Domino, 2011; Lennmarken & Sydsjo, 2007). A growing literature suggests the effective component in EMDR is exposure (Lilienfeld, 2008; Steketee & Goldstein, 1994), making the recommendation of EMDR in particular of unclear value. More generally, we find no compelling reason to believe that PTSD resulting from awareness during surgery requires a different modality of treatment than PTSD more generally. To date, no specific evidence has been presented regarding the use of standard, manualized treatment for this specific trauma.

Nixon, Bryant, and Moulds (2006) were the first to publish a report on the treatment of PTSD produced by awareness under anesthesia. These authors delivered eight sessions of CBT that consisted of exposure and cognitive restructuring (i.e., using CBT principles but no specific manual). At follow-up the client no longer met criteria for PTSD. Similarly, Mashour, Wang, Esaki, and Naughton (2008) reported use of systematic

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desensitization over the course of 7 months. In this treatment the patient completed in-vivo exposures in an operating room with anesthesiologists. At the end of treatment the psychologist reported that the patient no longer had PTSD. Though these initial results are encouraging, neither of the available case studies focuses on a well-established, manualized protocol. Demonstrating that this particular form of PTSD can be successfully treated using an established manual would be useful because that manual could then be used in future treatment, as well as research regarding this specific traumatic event. Furthermore, although there are appealing aspects to including in-vivo exposures in operating rooms, doing so would typically be expensive or impossible. Ideally, such treatment could also take place without special access to operating rooms. Our goals in the current study were to provide an example of a feasible treatment for PTSD from awareness using a manualized protocol that clinicians may use to treat similar clients. Further, we hope to illustrate some of the unique challenges that a clinician may encounter during such treatment and how the use of flexibility within the bounds of the evidence-based protocol may enhance treatment.

Current conceptualizations of the treatment of PTSD suggest that PET is an effective treatment of PTSD in many trauma populations (Foa et al., 2005). PET is based on emotional processing theory and works under the assumption that to recover from PTSD one must process the emotional memories connected to the traumatic event. However, PET has *not* explicitly been tested within a population presenting with PTSD from awareness during surgery. In the current study, we tested the use of PET using the manual *Treatments that Work: Prolonged Exposure Therapy for PTSD* (Foa, Hembree, & Rothbaum, 2007) with a woman who developed PTSD after awareness during a routine surgery.

The Case

The client was a 54-year-old Caucasian woman who sought treatment 1 month after a routine, outpatient surgery on her uterus. The client had undergone the same procedure in the past with no complications. The client reported no history of psychotherapy, receipt of diagnosis of mental disorders, and no use of psychotropic medications immediately prior to or during treatment, but did have a series of prior traumatic events (e.g., death of close relative, car accident). The client reported waking up in the middle of surgery with the ability to hear and process events around her. However, she was unable to gain the attention of the physicians surrounding her. The client described hearing conversations (e.g., the gynecologist talking to the anesthesiologist) and music playing during the surgery. The client had local anesthesia on her uterus and thus did not feel significant pain. However, the client reported feeling pressure as devices were inserted inside her and fearing that she would begin to feel pain at any moment. She reported trying to capture the surgeons' attention by calling out, moving her hands and feet, and opening her eyes. However, the client was unable to move, open her eyes, or call out. The client reported feeling extreme terror at her inability to move or gain the surgeons' attentions and fear that something would go wrong during the surgery (since she believed she was not supposed to be awake). The client alternated between trying to gain the attention of the surgeons by trying to move her limbs and trying to calm herself by concentrating on their voices and the music. The client described the experience such that her mind was trapped inside a paralyzed, useless body. In the client's words it was as though she were "stuck in a horror movie."

PTSD Symptoms

The client sought treatment for a variety of symptoms characteristic of PTSD as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2000), including avoiding talking about the event, feeling detached from others, feeling numb, having difficulty sleeping and concentrating, and being hypervigilant. Most noteworthy, the client was having extreme difficulty sleeping because (a) she was afraid of falling asleep because it reminded her of falling asleep under anesthesia before the surgery and (b) she was experiencing frequent nightmares in which she reexperienced awaking during surgery. The client was extremely hypervigilant, such that calling her name in the waiting room caused her to startle. The lack of sleep combined with hypervigilance had begun impairing her productivity at work and the quality of her social relationships. The client was avoiding any person or place that reminded her of the surgery because of the fear that the memory caused her, including avoiding her friend who had driven her to the surgery, as well as her physician calling to follow up.

Assessment

Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998–2006)

The MINI is a semistructured interview for diagnoses of Axis I disorders. At intake, the client met criteria for PTSD and no other Axis I disorder.

Beck Depression Inventory II (BDI-2; Beck, Steer, &Brown, 1996)

The BDI-2 is a 21-item self-report instrument that measures depression. Each symptom is rated for severity based on endorsement of one of a series of statements arranged in order from least to most symptomatic. Potential scores range from 0–63 (0–13 minimal depression, 14–19

mild depression, 20–28 moderate depression, 29–63 severe depression). At intake the client scored a 9.

Beck Anxiety Inventory (BAI; Beck et al., 1989)

The BAI consists of 21 self-report items that assess symptoms of anxiety, focusing on symptoms of anxious physiological arousal. Potential scores range from 0–63 (0–7 minimal anxiety, 8–15 mild anxiety, 16–25 moderate anxiety, 26–63 severe anxiety). At intake the client scored a 6.

PTSD Checklist (PCL; Weathers et al., 1993)

The PCL consists of 17 self-report items that assess symptoms of PTSD (e.g., avoidance, reexperiencing). Each symptom is rated on a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*extremely*). Potential scores range from 0–85. Research on the PCL has suggested that scoring at or above a 33 suggests a likely diagnosis of PTSD for civilians in a primary care clinic (e.g., Ruggiero, Del Ben, Scotti, & Rabalais, 2003). Additionally, the PCL has been shown to be useful for tracking symptom change throughout treatment, regardless of cutoff score. At intake the client scored a 53.

Subjective Units of Distress Scale (SUDS; Wolpe, 1988)

A behavioral measure often used during exposure treatment to assess current levels of anxiety, the SUDS ranges from 0 = *no anxiety, complete calm* to 100 = *the most anxiety you've ever felt or could imagine feeling*. SUDS ratings were given throughout the prolonged imaginal exposure work.

Treatment

Overview

The client was seen for 12 sessions that consisted of an intake assessment and 11 sessions of treatment for symptoms of PTSD. Treatment progressed largely according to the manual *Treatments That Work: Prolonged Exposure Therapy for PTSD* (Foa et al., 2007). The intake session consisted of an interview and diagnosis via the MINI (Sheehan et al., 1996–2006). At intake, the client met criteria for PTSD but no other Axis I disorders. Sessions 1 and 2 consisted of a trauma interview, psychoeducation about PTSD and PET, and development of an in-vivo exposure hierarchy. The trauma interview assessed all major traumas throughout the client's life and identified the trauma (the surgery) that would be focused on during PET. During Sessions 3–10 the client completed imaginal exposure and breathing exercises and completed in-vivo exposures out of session for homework. Session 11 was a wrap-up session.

Exposure Sessions

Sessions 3–10 began with homework review of in-vivo exposures and reading. After homework review, the client participated in breathing retraining, as described in the manual. Notably, the manual does not specify that breathing exercises should be completed in each session; however, the therapist was uncertain as to whether the client was practicing the skill outside of session and thus wished to make sure it was practiced at least during session. The breathing exercise was only used when the client was experiencing low levels of anxiety (i.e., either prior to an exposure in session or after her SUDS level had already substantially decreased and the exposure had ended). We did not use breathing retraining during heightened anxiety because of concern that breathing might serve as an avoidance technique for experiencing the anxiety from the trauma. In the later sessions we elected to substitute progressive muscle relaxation (PMR; Bernstein, Borkovec, & Hazlett-Stevens, 2000) for the short breathing exercise for reasons more fully explicated below. After the relaxation exercise, the client spent approximately 20 to 25 minutes in each session recounting her experience during the surgery. This recounting constituted the imaginal exposure aspect of the treatment. During these exposures, the client described waking up and trying to call out for attention, as well as her inability to move her body and the fear she experienced. The client was asked for her SUDS at approximately 4-minute intervals during imaginal exposure work.

As sessions progressed, imaginal exposures focused on the client's "hot spots" (Foa, Hembree, & Rothbaum, 2007, p. 100). As described in the treatment manual, *hot spots* are aspects of the trauma experience that are particularly distressing for the client. For example, recounting the events before the surgery created little anxiety for the client, and thus describing these events was not included in later exposures. Instead, the client was instructed to begin recounting immediately from when she awoke during surgery, which led to her highest amount of anxiety. At the end of the exposure, the client and therapist discussed emotions and thoughts that had arisen during the session and completed a final relaxation exercise (either diaphragmatic breathing or PMR). The audio of all sessions was recorded, and the client was assigned to listen to the audio recording daily and participate in in-vivo exposures out of session.

Homework

The client was instructed to practice the breathing exercise (or PMR in later sessions), listen to the audio tape of the session daily, and complete at least one in-vivo exposure from her in-vivo exposure hierarchy (Table 1). The client developed an in-vivo hierarchy with events such as calling the friend that drove her to surgery and emailing the anesthesiologist in charge of her surgery. Please see Table 1 for the in-vivo hierarchy and the client's initial SUDS ratings. Most of these events were avoided before therapy began because they reminded the client of her surgery, or because they would involve talking with

Table 1
In-Vivo Exposure Hierarchy

Exposure	SUDS
Watching horror movie	100
Talking to anesthesiologist in person	98
Talking with mother on phone	97
Visiting surgery exhibit at museum	95
Emailing anesthesiologist	94
Getting on motorcycle	85
Accepting invitation from friend that drove client to surgery	75
Talking with daughter on phone	60
Talking to friend on phone	60
Talking to attorney	55
Watching movie	50

Note. All tasks are linked such that they included talking about the event (i.e., with her attorney, friend, daughter, and anesthesiologist) or that they provoked anxious feelings similar to those experienced during the surgery and were anxiety provoking because of that similarity (i.e., watching horror movie, getting on a motorcycle, visiting surgery exhibit).

others about the surgery. For example, the client did not want to call her daughter because she felt she would have to tell her daughter that she was not feeling well because of the surgery.

PMR Combined With Exposure

During later sessions the client reported having continued difficulty with sleep. During the night the client would have nightmares of her body as a twisted mass of muscles. The client also reported that this image preoccupied her both during and after the surgery. Further, the image came to mind for the client during prolonged exposures. Impaired sleep and nightmares are common and persistent complaints among people with PTSD (e.g., Krakow et al., 2001). Recent empirical research has developed treatments specifically targeting trauma-related nightmares, using imagery rehearsal (i.e., rescripting a portion of the nightmare) as a therapeutic technique (Forbes et al., 2003; Krakow et al.). Davis and Wright (2005) modified these treatment protocols to incorporate exposure, relaxation, and rescripting therapy for treatment of nightmares from PTSD. Davis and Wright report a reduction in nightmare frequency and in overall PTSD and depression symptoms as a result of this therapy. In regard to relaxation techniques, PMR has been reported as an effective nonpharmacological intervention to improve sleep quality (de Niet, Tiemens, Kloos, & Hutschemaekers, 2009).

Given the research support for the combination of relaxation, exposure, and rescripting in reducing nightmares, the efficacy of PMR in improving sleep, and the clients' continued distress with nightmares and insomnia, PMR was incorporated into the treatment plan along with rescripting based on PMR as a way to enhance exposure and facilitate approach toward the emotions experienced during the surgery. Starting in Session 9 we incorporated PMR into the client's description of the image while she rescripted the image. The client was asked to describe awaking from surgery and the image she experienced (e.g., a twisted mass of muscles). She was then asked to describe the tension in her muscles both in vivo and in the image. As she was describing this image she was instructed to tense and release her muscles and imagine that her muscles were no longer tightly wound. The client reported that this type of exposure enhanced her feelings of control and ability to engage in the emotions experienced during the exposure. The client was instructed to practice this type of exposure for homework. Arguably, this form of PMR provided an additional exposure experience for the patient.

Outcome

Self-Report Scores

The client's scores on the PCL, BDI-2, and BAI are reported in Figure 1. At intake, the client met the cutoff for civilian outpatients on the PCL for PTSD (Ruggiero et al., 2003). As can be seen in Figure 1, over the course of the 12 sessions the client's scores on the PCL dropped substantially, and at 6 weeks and 10 weeks follow-up the client reported minimal symptoms of PTSD. The client's response rate is consistent with literature on the course of PTSD symptoms during PET (Tuerk et al., 2011). Notably, the client never scored high on the BAI or BDI-2; her scores on those measures remained relatively consistent across treatment and follow-up. Her self-report regarding symptoms of anxiety related to excessive physiological arousal and depression is consistent with PTSD as her sole diagnosis via the MINI structured interview. This pattern demonstrates that treatment affected change in PCL

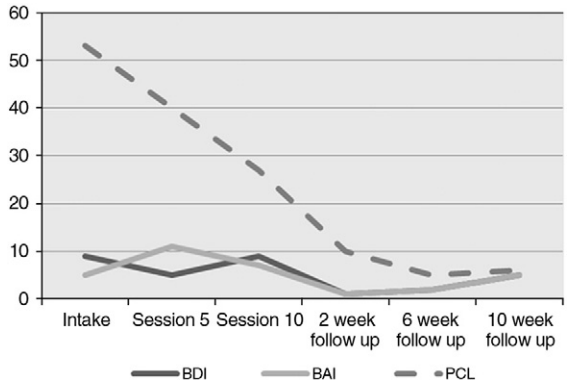

Figure 1. BDI = Beck Depression Inventory 2; BAI = Beck Anxiety Inventory; PCL = Post-traumatic stress disorder checklist. A score of 33 suggests a diagnosis of PTSD.

scores but not in more general symptoms, although an alternative hypothesis is that the latter scores simply showed a floor effect. We tested whether the change (47 points) between intake score (PCL=53) and 10-week follow-up (PCL=6) was clinically significant and reliable (Jacobson & Truax, 1991) using the Reliable Change Generator (Devilly, 2005). We used the reported test-retest reliability of .96, and means for a civilian PTSD clinical population (M=64.2, SD=9.1) and a normal population (M=29.4, SD=11.5) (Weathers et al., 1993). Results indicated that with 99% certainty reliable change had occurred and that this change was clinically significant such that the client's post score was more consistent with the normal distribution than the clinical distribution. It may also be noted that the National Center for PTSD recommends that a 10–20 point change in PCL scores represents clinically significant change (National Center for PTSD, 2010), whereas this client achieved a change of 47 points.

SUDS

During the first session of imaginal exposure (Session 3), the client reported a peak SUDS level of 100 and minimum of 50 during the retelling of her story. At the second exposure session, the client reported a peak SUDS level of 98 and minimum of 30. At the final imaginal exposure session (Session 10), the client's maximum SUDS level was 35 and the minimum was 5. This change suggests that the client had (a) at least some between-session habituation across the first two exposures and (b) considerable between-session habituation across treatment when talking about her surgery. Notably, between-session habituation has been shown to be a robust predictor of overall response in this form of treatment (Jaycox, Foa, & Morral, 1998).

In-Vivo Exposures

The client was able to complete every exposure on the hierarchy except watching a horror movie. Overall, exposures went well and in spite of experiencing significant anxiety at times, the patient was able to complete each assignment.

Posttreatment Functioning

In addition to showing significant decreases in anxiety scores, the client reported gains in overall functioning such that she felt "like her normal self again." The client was able to sleep through the night, talk with friends and family, visit her doctor, and continue working.

Discussion

This case study detailed treatment of a woman suffering from PTSD that developed after awareness during a routine surgery. Prolonged exposure therapy (PET) as outlined in *Treatments That Work: Prolonged Exposure Therapy for PTSD* (Foa et al., 2007) was utilized. The client's scores on the PCL (Weathers et al., 1993) suggest that at 10-week follow-up the client no longer met criteria for PTSD. From the intake session to 10-week follow-up the client exhibited reliable, clinically significant change in her score on the PCL. We believe that this outcome suggests that utilizing a manualized form of PET can be effective for the treatment of PTSD triggered by the specific trauma of awareness during surgery. More generally, we expect that any treatment that has been shown to be effective for PTSD overall should also be useful in this specific population. Of course, future studies would ideally test this assertion across individuals.

During the course of therapy there were several instances of treatment tailoring that are worthy of discussion. First, the treatment manual used suggests allotting 40 to 45 minutes for the retelling of the client's story. We found that 20 to 25 minutes was a sufficient amount of time for the client to recount her experience and to achieve high levels of anxiety as measured by the SUDS. Whether this difference was due to the nature of her trauma generally, or was specific to this client, is unclear. Second, the client reported considerable difficulty with sleep throughout the course of treatment. We believe that sleeping reminded the client of the experience of undergoing anesthesia for her surgery. In addition, we incorporated PMR into treatment to facilitate the imaginal exposures. This intervention has been reported as efficacious as a nonpharmacological intervention to improve sleep quality (de Niet et al., 2009), and thus addressed the client's difficulties with sleep in addition to providing another experience of exposure to her concerns about muscle tension, which is applied during PMR. In addition, PMR had the virtue of specifically addressing and experientially rescripting the client's imagery of twisted muscles into relaxed muscles and nightmares related to her surgery. We would recommend caution in the use of rescripting in such a way that it constituted avoidance (i.e., if the client were changing the scenario to avoid the feelings experienced by the actual trauma). It may also be that PMR functioned in this client's treatment similarly to other suggested adjuvant treatments, such as interoceptive exposure (e.g., Wald & Taylor, 2007). Our intent in tailoring the intervention was to retain the spirit of the evidence-based protocol while potentially enhancing it for this particular client using compatible additions. We should note that any deviations from protocol should be considered carefully. It could be taken as a limitation of this study that we did not follow the manual in every detail, given our concerns that previous studies did not utilize published manuals. However, all of our departures from the manual entailed the use of techniques that are either part of other published manuals or have been

described in detail in the literature and are relatively easily employed by an individual clinician. In contrast, previous reports of treatment of PTSD from awareness during surgery employed *no* published manual, and in one instance focused on in-vivo exposures in an operating room (Mashour et al., 2008). Although these previous studies demonstrated the use of CBT principles in treatment, ours remains the first to focus treatment primarily on a published manual and a method that is easily replicable by individual clinicians.

Overall, this case study provides support for the use of PET for PTSD from awareness during surgery. Awareness during surgery affects approximately 40,000 to 140,000 individuals yearly (Osterman et al., 2001), a significant percentage of whom may experience PTSD as a result. Further research appears warranted on the consequences of awareness during surgery and the treatment of those individuals who develop PTSD as a result of this potentially traumatic experience. We hope that this case study will be a step towards understanding and development of empirically based interventions to relieve such suffering.

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